

# Status of Women Statisticians in the Drug Industry

**Sheela Talwalker<sup>1</sup>, Ph.D. and Sonali T. Sikchi<sup>2</sup>, M.S.**

*<sup>1</sup>Chief Scientific Officer, T'Walker Consulting, 11276 Caminito Rodar, San Diego, CA 92126, U.S.A. E-mail: sheela\_talwalker@hotmail.com. <sup>2</sup>19373 SE 57<sup>th</sup> Place, Issaquah, WA 98027, U.S.A. E-mail: sonali\_sikchi@hotmail.com.*

## Summary

The focus of this study was to understand the challenges and problems faced by women statisticians (WS) working in the drug industry in the United States at present or in the past, with emphasis on evaluating the opportunities women statisticians get for career growth and their satisfaction with management help in achieving it, participation in management and strategic decisions, their contributions to leadership in the drug development process and the recognition they received for their contributions, the link between their representation in the industry and their vertical movement within their organizations, and measurement of the status of minority women statisticians in the industry.

The study questionnaire was hosted on the International Statistical Institute (ISI) Committee on Women Statisticians website. WS in the drug industry were contacted by the biopharmaceutical section of the American Statistical Association (ASA) e-mail list moderator. Out of the 204 responses received by December 31, 2002, 158 responses were valid, i.e., from WS who had worked in the drug industry in the past or present. Considering that all the respondents remained completely anonymous, they were not reminded again or offered any inducement as compensation for their time, it was concluded that the response was adequate for the purposes of this study.

For the purposes of this study, the drug industry in the United States is defined by the Pharmaceutical Companies (pharma sector), the Biotechnology Companies (biotech sector), and the Clinical Research Organizations (CRO sector). Companies engaged in drug discovery are required to employ statisticians in large numbers, in order to meet strict regulations and guidelines set by the Food and Drug Administration (FDA) for analyses of data included in the submission of New Drug Applications. Statisticians play a vital role in the drug development and drug approval processes by helping pre-clinical and clinical research teams in planning and designing animal and human studies, analyzing data, preparing reports, and interpreting the results obtained. Statisticians also participate in presenting the results to outside agencies, including regulatory agencies such as the FDA. It is estimated that women statisticians (WS) represent one third of the statistical workforce employed in the drug industry (Pichotta 1996).

Majority of the WS at different career levels (66%), found their current work environment encouraging or stimulating.

Majority of WS had high interest and ambition in advancing their careers, indicated by the number of WS who changed jobs for career advancement, who were interested in learning more about the different areas of drug development, and who chose to work full time. WS changed three jobs on average, with maximum number (77%) changing jobs for career growth (i.e., for better opportunity, more responsibility, more challenging work, or due to lack of opportunity) with comparable representation of CWS (Caucasian Women Statisticians) and NCWS (Non-Caucasian Women Statisticians), thereby indicating that they were equally ambitious. Majority of WS (92%) worked full time in their present jobs. Only 8% WS worked part time, though an additional 18% WS preferred to not work overtime, with family commitments being the overriding reason (70%). Thus, it would seem that WS preferred working full time in view of their career growth. In the absence of models to manage personal and professional lives and career growth, supervisors were reluctant to promote those who worked part time or could not work overtime. Committees on WS, along with the drug industry, need to consider the development of such a model.

Helpfulness of management in professional and career growth was judged by the availability of different facilities, such as strong mentorship, management training, creation of career ladders, funded attendance at professional conferences, advanced technical training, opportunity to conduct methodological research, opportunity to gain experience in other areas of drug development, opportunity to make significant contributions, and satisfaction with recognition received for the contributions.

Funding for advanced technical training (58%) and conference attendance (72%) was available to majority of WS. It is a common practice in the drug industry to provide funding for conference attendance and advanced technical training. Facilities for strong mentorship and for experience in related areas of drug development were available to 35% and 32% of WS, respectively. Graded response to satisfaction with management help towards career growth showed that 54% WS found the help to be satisfactory, 38% were neutral, while 8% were dissatisfied. Seventy-four percent of WS, who were neutral, perceived management's attitude as discouraging or unsupportive.

Thirty-four percent WS felt they got none or very few opportunities to make significant contributions to the drug development process; 49% WS felt they had some opportunities, while only 17% WS felt they had many. It is observed here that among the WS with very few or no opportunity, percentage of NCWS (42%) was considerably higher than that of CWS (31%), while among those with many opportunities, percentage of NCWS (11%) was considerably lower than that of CWS (19%). More than half (52%) of the respondents were satisfied with the recognition they received for their significant contributions, in terms of promotions, bonuses, acknowledgment, and more responsibility, although less than a fifth had many opportunities to make those contributions.

Logistic Regression Modeling of satisfaction with management help received towards career growth, using the presence or absence of these facilities as independent variables, revealed that chances of satisfaction were high among those WS who were satisfied with the recognition received for their contributions, and those who had the facility of strong mentorship, career ladders, and funding for conference attendance.

Sixty-five percent WS were at the statistician or senior statistician (non-supervisory) level. Twenty-two percent WS were at the supervisory level and 13% were at the director or higher (leadership) levels. Less than 2% (1.3%) were at the vice-president level supervising large number of people. These figures support the observation made by Long (2001), namely, women are a visible force, but the majority of them are at lower levels and vertical movement is not forceful. Given the high numbers of CWS versus NCWS in the industry, comparable percentages in supervisory (22% vs. 24%) and leadership roles (13% vs. 13.5%) suggest that there is a selection bias. It appears that only WS in leadership roles or successful NCWS, who are members of the ASA biopharmaceutical section, have chosen to respond to the survey.

Thirty-three percent WS experienced discrimination at one point or another in their careers due to their gender, age, nationality, ethnicity, and inability to work full time or overtime. Discrimination increased with increasing career level, though only 9% WS left their jobs for reasons of discrimination. Cases of gender discrimination were maximum (73%). Racial bias was revealed by the low percentages of NCWS with many opportunities to make significant contributions and high percentages of NCWS with little or no opportunity, and by the longer work experience ( 6 and 10 years for NCWS as opposed to 3 and 7 years for CWS in the supervisory and leadership roles, respectively), and higher degrees required for similar positions ( 59% for NCWS vs. 37% for CWS, see graphs 1 &2).

Only one WS was a member of ISI and many did not even know about its existence, although there are at least 41 U.S. WS members (Carlson 2000), indicating that the ISI Committee on Women in Statistics needs to be a visible force in the drug industry. ISI and its sections need to make efforts to work independently, or with some organization, to initiate a dialogue with the drug industry to provide a way for WS to find mentors in leadership roles, to set up a network, to facilitate seminars and workshops on balancing family and career, and to institute family-friendly policies in workplaces in view of higher career growth satisfaction and increased productivity. The ISI Committee on Women in Statistics also needs to make high achievers more visible.

*Key words:* Drug industry; Women statisticians; Demographics; Work environment; Non-supervisory role; Supervisory role; Leadership role; Opportunities; Significant contributions; Career growth

### **Survey Methodology and Responses**

The thirty-item survey questionnaire (see Appendix II) was hosted on the website of the ISI Committee on Women in Statistics and WS in the drug industry were contacted via a personal appeal forwarded by e-mail that included a hyperlink to the survey. It is surmised that this method of conducting the survey ensured the complete anonymity of the survey respondents, leading to quick, honest, and candid responses and a higher response rate.

It would've been very difficult to contact all the WS working in all the drug companies across the United States due to time and financial constraints. Due to confidentiality reasons, it would've been highly unlikely to obtain permission from companies to

approach WS in their workforce and to acquire their e-mail addresses. Assuming that the majority of the WS from the industry would be members of ASA (84%), personal appeal and the link to the study questionnaire was forwarded via e-mail to 1700 members of the ASA biopharmaceutical section, with help from Dr. Sally Greenburg in September 2002. Also, an announcement about the survey appeared in the October 2002 issue of AMSTAT News. In addition, local chapter officers and friends in the industry were also contacted and requested to forward the message to their chapter members and WS in their departments. A response from a WS, who worked in the drug industry one time or another, was considered to be a valid response.

From the survey conducted by Pichotta (1996) of 1770 members of the ASA biopharmaceutical section, it was observed that the percentage response of the WS working in the drug industry to the questionnaire was 11.6%. Assuming similar response to the present questionnaire sent to 1700 members, it was estimated that 197 WS would respond. Out of 204 responses received by December 31, 2002, 158 were valid responses. Considering that all the respondents remained completely anonymous, there was no way to remind non-respondents by surface mail, e-mail, or phone calls, and no inducement was offered to compensate the WS for their time, it was concluded that the response was adequate for the purposes of this study.

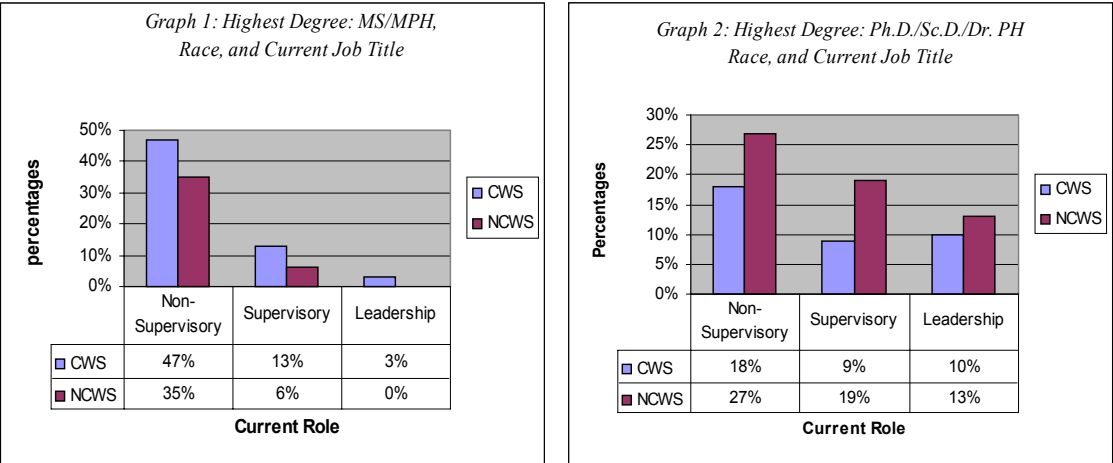
This study is a good example of “Convenience Sampling and Snowball Sampling” (Trochim 2000). Convenience sampling is where specific pre-defined groups are sampled. For example, in a clinical trial, specific types of patients representing the patient population are selected. This kind of sampling can be very useful for situations where a targeted population needs to be reached and their opinions sought. The downside of this method is that it is likely to overweight subgroups that are more readily accessible or readily willing to respond to the questionnaire. Snowball Sampling is commenced by identifying someone who meets the criteria for inclusion in the study. The identified ones are then asked to recommend others whom they know and who also meet the criteria. Snowball Sampling is especially useful when populations that are inaccessible or hard to find need to be reached, and where sampling for proportionality is not the primary concern. Thus, for the present study, Convenience and Snowball sampling were the best possible methods available.

The disparity between the two genders in the industry and science institutions with respect to upward mobility on the career ladder and monetary compensation has been identified again and again in many different surveys (for example, Long 2001). Hence, this study does not assess those gender differences.

### **Demographics and Professional Background**

Among the respondents to the study, Caucasian WS (CWS) were in the majority at 76%, followed by 20% Asian WS (AWS), and 3% WS of other ethnicities; 1% WS did not respond. Sixty-eight percent WS were between the ages of 31 and 50, while 17% were younger than 31, and 15% were older than 50 years of age (see [Table 1](#)).

All of the respondents had at least a Masters degree in Statistics and 44% had a doctorate of philosophy, science, or public health. Fifty-nine percent non-Caucasian WS (NCWS) had a doctorate degree versus 39% CWS, indicating either that NCWS needed to have higher degrees in order to compete with CWS for the same positions, or that many NCWS originally came to the U.S. as graduate students seeking doctorates and joined the workforce after graduation (see [Graphs 1 & 2](#) and [Tables 2 & 3](#). These graphs do not include 4 CWS with Ph.D. and 1 WS with MS).



Majority of the WS (77%) worked in the pharma sector, whereas 21% worked in the biotech sector and 36% in the CRO sector at one point or another during their career (see [Table 4](#)). Twenty-nine percent of WS had less than five years of experience in the drug industry, 30% had 5 to 9 years of experience, 23% had 10 to 14 years of experience, 12% had 15 to 19, and 6% had 20 or more years of experience (see [Table 5](#)). Seventy-seven percent WS left previous jobs for advancement of their career, 24% left previous jobs for inadequate compensation, 30% due to poor management, 33% for family reasons, while 9% WS left their previous jobs for reasons of discrimination (see [Table 6](#)).

### Responsibilities, Work Environment, and Career Growth

Sixty-five percent WS were at the statistician or senior statistician (non-supervisory) level. Twenty-two percent WS were at the supervisory level and 13% were at the director or higher (leadership) levels, with comparable representation of CWS and NCWS at both the levels (see [Table 5](#)). Less than 2% (1.3%) were at the vice-president level supervising large number of people. These figures support the observation made by Long (2001), namely, women are a visible force, but the majority of them are at lower levels and vertical movement is not forceful.

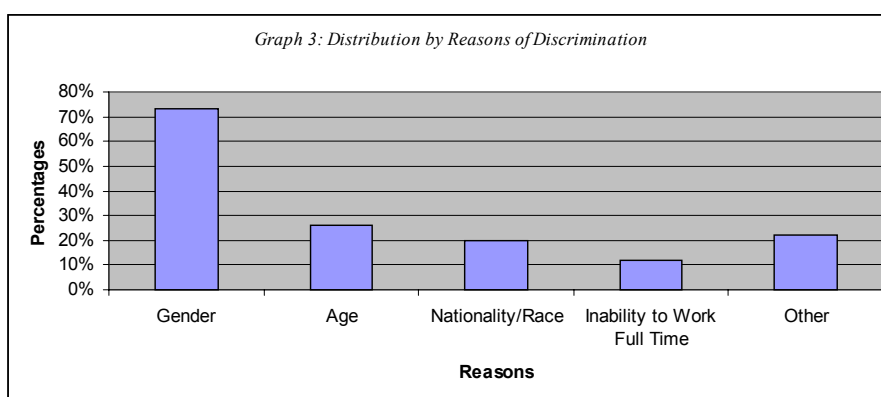
Given the high numbers of CWS versus NCWS in the industry, comparable percentages in supervisory (22% vs. 24%) and leadership roles (13% vs. 13.5%) suggest that there is a selection bias. It appears that only WS in leadership roles or successful NCWS, who are members of the ASA biopharmaceutical section, have chosen to respond to the survey. Selection bias, if present, is somewhat similar to the selection bias in the publication of

clinical trial results, where the tendency is to only publish results of trials in which the investigational drug is found to be significantly better than the comparator.

CWS in supervisory and leadership roles had minimum industry experience of 3 and 7 years, respectively, as opposed to 6 and 10 years, respectively, for NCWS in similar roles (see [Table 5](#)). It appears that NCWS need to have longer work experience to achieve the same status as their CWS colleagues.

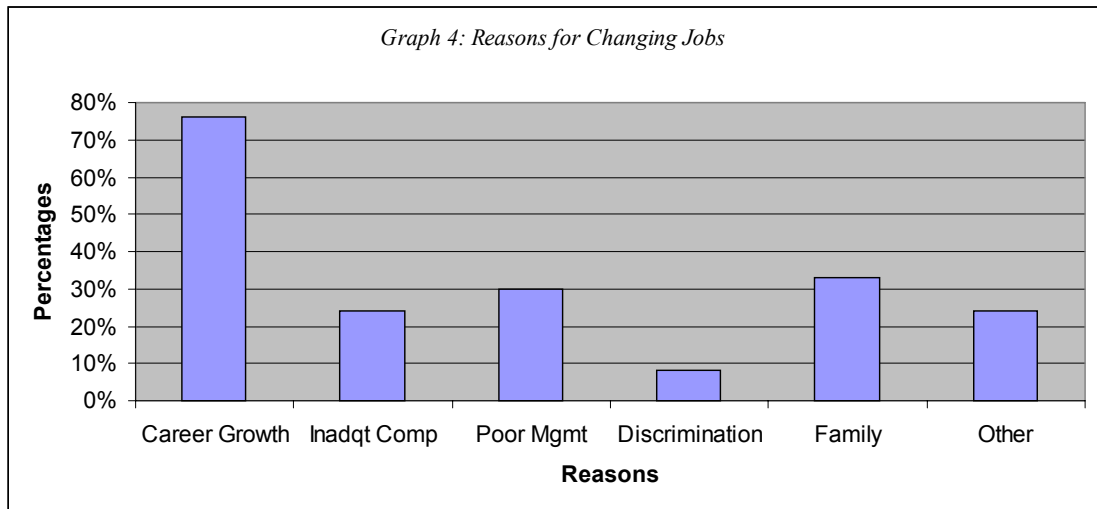
Sixty-six percent WS found the current work environment stimulating or encouraging with comparable representation at all career levels (see [Table 7](#)). Among the WS in non-supervisory roles, 62% found the environment encouraging and stimulating, as opposed to 38% who felt otherwise. Among the WS in supervisory roles, 67% found it encouraging or stimulating, as opposed to 33% who felt otherwise. Among the WS in leadership roles, 85% found it encouraging or stimulating, as opposed to 15% who felt otherwise (see [Table 7](#)).

Thirty-three percent WS felt discriminated at one time or another in their career due to their gender, age, nationality, ethnicity, and/or inability to work full time or overtime. Among them, gender discrimination was the most common reason at 73%, followed by nationality/ ethnicity and inability to work full time/over time at 31%, and age at 25% (see [Graph 3](#) and [Table 8](#)). Twenty-six percent WS in non-supervisory roles, 38% in supervisory roles, and 60% in leadership roles perceived discrimination in their career, indicating that discrimination increased with increasing rank (see [Table 9](#)). This observation corroborates the observation made in the report of a study on the status of women faculty in science at the Massachusetts Institute of Technology (Bailyn 1999), Tenured women faculty were marginalized and excluded from playing a significant role in their departments, despite professional accomplishments equal to those of their male colleagues, whereas junior women faculty felt well supported within their departments and most did not believe that gender bias would impact their careers differently from their male colleagues. In their study of 699 men and women U.S. scientists, Sonnert and Holton (1995) reported a much higher number (three-fourth) of women scientists experiencing discrimination, whereas this study showed a much smaller number of WS (33%).



Interest in career growth was judged by interest in learning about different aspects of drug development, working hours, and number of WS who changed jobs for career advancement.

WS changed three jobs on average, with maximum number (77%) changing jobs for career growth (i.e., for better opportunity, more responsibility, more challenging work, or due to lack of opportunity) with comparable representation of CWS (75%) and NCWS (80%), thereby indicating that they were equally ambitious (see [Graph 4](#) and [Tables 6 & 10](#)).

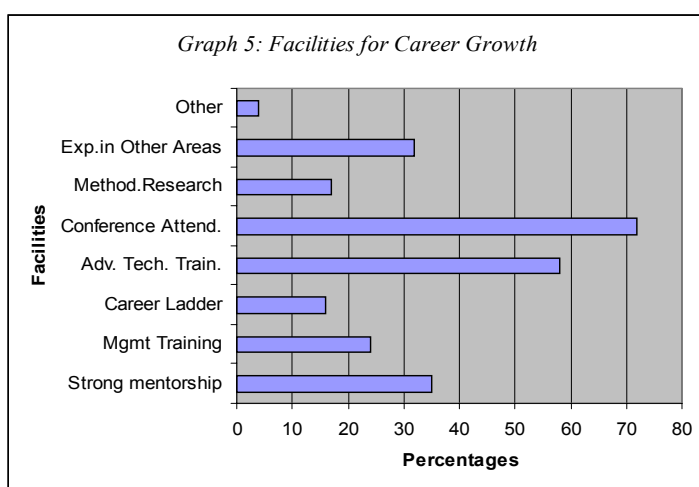


Majority of WS (92%) worked full time. Eight percent of total WS worked part time, and 18% WS working full time preferred not working overtime, with family commitments being the overriding reason (70%). Among the WS working full time and ready to work overtime, 59% were in non-supervisory roles and 41% were in supervisory and leadership roles. Among the WS working part time and those working full time but unwilling to work overtime, 82% were in non-supervisory roles and 18% were in supervisory and leadership roles. Thus, it would seem that WS preferred working full time and overtime in view of their career growth (see [Tables 11, 12, & 13](#)). It is surmised that in the absence of models to manage personal and professional lives and career growth, supervisors were reluctant to promote those who worked part time or could not work overtime. Committees on WS, along with the drug industry, need to consider the development of such a model.

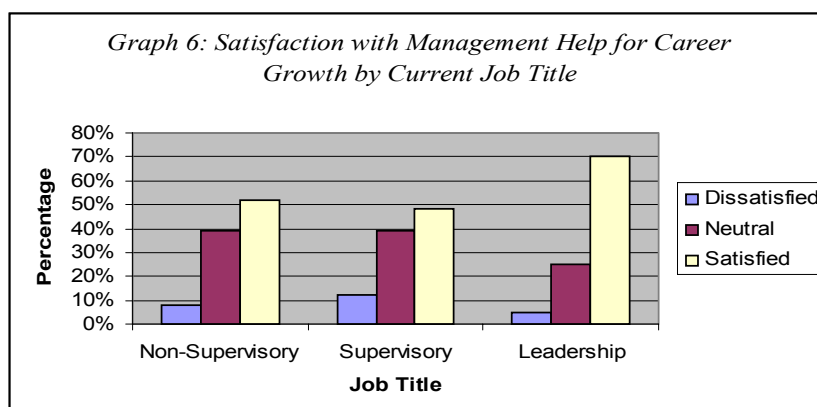
Sixty-seven percent WS were interested in at least 2 aspects of drug development, which included gaining experience in data management, programming, data validation, regulatory affairs, post-marketing surveillance of marketed drugs, project management, and methodological research (see [Table 14](#)). Most popular areas of interest were project management (45%) and methodological research (42%). In spite of interest in methodological research (see [Table 15](#)), separate research facility at work, in terms of time allotted for research or organization of discussion groups, was available to only 17% (see [Table 16](#)).



Helpfulness of management in professional and career growth was judged by the availability of different facilities like strong mentorship, management training, creation of career ladders, funded attendance at professional conferences, advanced technical training, opportunity to conduct methodological research, opportunity to gain experience in other areas of drug development, opportunity to make significant contributions, and satisfaction with recognition received for the contributions. Funding for advanced technical training (58%) and conference attendance (72%) was available to majority of WS. It is a common practice in the drug industry to provide funding for conference attendance and advanced technical training. Facilities for strong mentorship and for experience in related areas of drug development were available to 35% and 32% of WS, respectively. Other facilities were available to less than 25% WS (see [Graph 5](#) and [Table 16](#)).

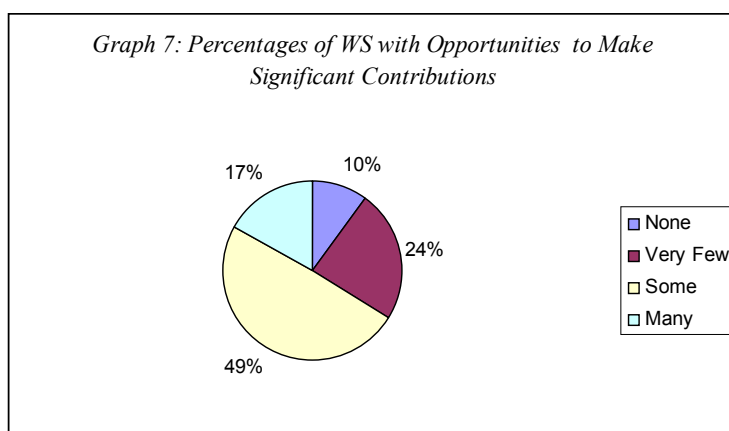


Graded response to satisfaction with management help towards career growth showed that 54% WS found the help to be satisfactory, 38% were neutral, while 8% were dissatisfied (see [Table 17](#)). Fifty-two percent of WS in non-supervisory roles, 48% in supervisory roles, and 70% in leadership roles were satisfied with management help received (see [Graph 6](#)). Of the WS who perceived management's attitude as discouraging or unsupportive, 72% percent of WS chose to remain neutral in response to the item on their satisfaction with management help for career growth (see [Table 18](#)).

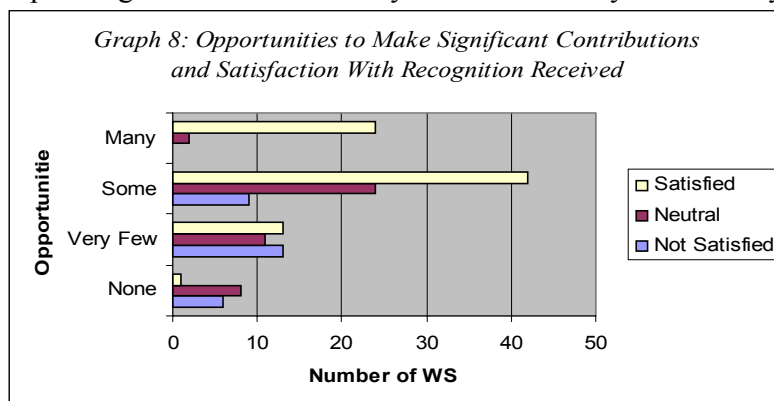




Opportunities to make significant contributions to the drug development process were determined in terms of presentations to senior management, participation in the preparation of important papers and policy documents, and membership of decision-making teams. Thirty-four percent WS, with 31% and 42% representation of CWS and NCWS, felt they got none or very few opportunities to make significant contributions, and 48% WS felt they had some opportunities, with comparable representation of CWS and NCWS. Only 17% WS, with 19% CWS and 11% NCWS, felt they had many opportunities to make significant contributions. It is observed here that among the WS with little or no opportunity, percentage of NCWS was considerably higher than that of CWS. In contrast, among those with many opportunities, percentage of NCWS was considerably lower than that of CWS (see [Graph 7](#) and [Table 19](#)).



More than half (52%) of the respondents were satisfied with the recognition they received for their significant contributions to the drug development process, in terms of promotions, bonuses, acknowledgment, and more responsibility, although only 17% had many opportunities to make those contributions. Among the WS who were neutral or satisfied with the recognition they received, 26% had very few or no opportunities to make contributions and 52% had only some opportunities (see [Graph 8](#) and [Table 19](#)). These results indicate that these WS were perhaps not eager to make significant contributions and be visible at the workplace, or they were satisfied with the salary and compensation received, they were being accommodating and complacent, or they felt uncomfortable expressing themselves truthfully even to an anonymous survey.



Those WS who did not get opportunities to make significant contributions were asked if their perception was that men, younger women, or women of certain races were given opportunities denied to them. Eleven percent WS responded affirmatively, 29% responded negatively, while remaining 60% declined to respond to this question (see [Table 20](#)).

Logistic Regression Modeling of satisfaction with management help towards career growth, using the presence or absence of these facilities as independent variables revealed that percentages of satisfaction were high among those who had the facility of strong mentorship, career ladder, funding for conference attendance and those who were satisfied with recognition received for their contributions. Corresponding odds ratios and 95% confidence intervals were 15.8 (4.2, 59.7), 9.3 (1.3, 67.2), 6.6 (1.7, 25.7), and 3.2 (1.6, 6.5), respectively.

### **Extracurricular Activities**

WS were asked to describe professional extracurricular activities undertaken by them to create awareness or increase interest in statistics in the community, by mentoring students and/or teachers at schools or universities, organizing or chairing panels of statistics-related community activities, such as competitions, general interest lectures, etc. Only 29% WS responded to this item. Mentoring students was the most popular activity with 72% WS participating. Eleven percent WS were involved in organizing community events, while 17% did both (see [Table 21](#)). Maximum participation in mentoring students and college teachers could be due to the fact that this activity is encouraged and financially supported by management in many pharmaceutical companies.

### **Acknowledgements**

Special thanks are due to the following for their support: Beverley Carlson, Chair of the ISI Committee on Women in Statistics; Nanjamma Chinnappa and Mary Regier, current and former website editors of the ISI Committee on Women in Statistics, respectively; the survey committee of the American Statistical Association (ASA); Dr. William Smith, Director of Administrative Services of ASA; Dr. Sally Greenburg, e-mail list moderator for the ASA biopharmaceutical section; Ank Lepping, technical support staff of the ISI website in The Netherlands; Jay Hu for the Logistic Regression Analyses, Sohan Talwalker for setting up the database in Microsoft Excel and reviewing the manuscript very carefully; all the women statisticians who offered suggestions and comments on the initial drafts of the questionnaire; and all the women statisticians who participated in the survey.

### **References**

- Bailyn, L. (1999). *A study on the status of women faculty in science at MIT*. MIT Faculty Newsletter, Special Edition, Vol.XI No.4, Boston, U.S.A.
- Carlson, B.A. (2000). *Women in the Statistics Profession: A Status Report*, International Statistical Review, Voorburg, The Netherlands.

Cervetto, L.B., Curti C., Masaútis, A., Verón M., García, M.V. (2001). *A Characterization of Statisticians by Gender in Several Countries*, [www.cbs.nl/isi/cws/charactreport.htm](http://www.cbs.nl/isi/cws/charactreport.htm).

Long, E.J.S. (2001). *Scarcity to Visibility: Gender Differences in the Careers of Doctoral Scientists & Engineers: A Report*. National Academy Press, Washington, D.C., U.S.A.

Pichotta, P.J. (1998). *Report of October 1996 Survey of Biopharmaceutical Section Members*, [www.amstat.org/sections/sbiop/survey.htm](http://www.amstat.org/sections/sbiop/survey.htm).

Schonlau, M., Fricker Jr., R.D., Elliot, M.N. (2001). *Conducting Research Surveys via e-mail and the Web*. Rand Publications, MR-1480-RC.

Sonnert, G., Holton, G. (1995). *Gender Differences in Science Careers*. Rutgers University Press, New Brunswick, U.S.A.

Trochim, W.M. (2000). *The Research Methods Knowledge Base*, 2<sup>nd</sup> Edition. [trochim.human.cornell.edu/kb/index.htm](http://trochim.human.cornell.edu/kb/index.htm) (version current as of August 2, 2000).

## Appendix I: Result Tables

**Table 1**

*Age Distribution by Race/Ethnicity*

Race/Ethnicity	21-30	31-40	41-50	51-60	61-70	NA	Total
African American	0	0	0	0	0	1	1 (≈1%)
Asian American	1	19	9	0	3	0	32 (20%)
Caucasian American	25	44	31	18	2	0	120 (76%)
Other	1	2	1	0	0	0	4 (3%)
Not Available (NA)	0	0	0	0	0	1	1 (≈1%)
Total	27	65	41	18	5	2	158

**Table 2**

*Distribution by Race/Ethnicity and Highest Education Degree*

Race/Ethnicity	MS/MPH n (%)	PhD/ScD/DrPH n (%)	Total N
African American	0	1 (100%)	1
Asian American	14 (44%)	18 (56%)	32
Caucasian American	73 (61%)	47 (39%)	120
Other	1 (25%)	3 (75%)	4
Not Available	1 (100%)	0	1
Total	89 (56%)	69 (44%)	158

**Table 3**

*Distribution by Current Job Title, Race/Ethnicity, and Highest Education Degree*

Current Title	Race / Ethnicity	Highest Degree		Total
		MS/MPH	PhD/ScD/DrPH	
Statistician	CWS	21	6	27
	NCWS	9	3	12
Senoir Statistician	CWS	34	15	49
	NCWS	4	7	11
Supervisor	CWS	15	10	25
	NCWS	2	7	9
Leadership Role	CWS	3	12	15
	NCWS	0	5	5
Not Available	CWS	0	2	2
	NCWS	0	0	0
	NA	1	0	1
Total		89	67	156

(Note: Two CWS with PhDs were temporary employees and are not included here. Director or higher job title is referred to Leadership Role in the table)

**Table 3a***Distribution by Nationality and Country of Highest Education Degree*

Nationality	Country of Highest Education Degree					Total
	Asian Countries	Canada	European Countries	USA	NA	
Asian Countries	0	1	0	15	1	17
Canada	0	4	0	0	0	4
European Countries	0	0	8	10	0	18
USA	0	0	0	76	6	82
Not Available	0	0	0	29	8	37
Total	0	5	8	130	15	158

(Note: Forty-four WS did not supply information on either nationality, country where they obtained their highest education degree, or both)

**Table 4***Distribution by Industry Sectors*

Sector	Total
	N (%)
Pharma	77 (49%)
Biotech	9 (6%)
CRO	25 (16%)
Pharma & Biotech	15 (9%)
Pharma & CRO	22 (14%)
Biotech & CRO	2 (1%)
Pharma, Biotech, & CRO	8 (5%)
Total	158

**Table 5***Distribution by Current Job Title, Race/Ethnicity, and Number of Years of Industry Experience*

Current Title	Race/Ethnicity	<5	5-9	10-14	15-19	20-24	>=25	Total
Statistician	CWS	15	9	2	0	0	1	27
	NCWS	8	2	2	0	0	0	12
Senior Statistician	CWS	13	20	8	6	2	0	49
	NCWS	6	3	2	0	0	0	11
Supervisor	CWS	1	6	11	5	1	1	25
	NCWS	0	4	2	2	0	1	9
Leadership Role	CWS	0	2	4	6	1	2	15
	NCWS	0	0	4	0	0	1	5
Not Available	CWS	1	0	1	0	0	0	2
	NCWS	0	0	0	0	0	0	0
	NA	1	0	0	0	0	0	1
Total		45	46	36	19	4	6	156

(Note: Two CWS who were temporary employees are not included)

**Table 6**  
*Distribution by Race/Ethnicity and by Multiple Reasons for Changing Jobs*

Race/Ethnicity	Reasons						
	Career Growth	Inadequate Compensation	Poor Management	Discrimination	Family	Other	NA
CWS	75	25	31	8	33	26	20
NCWS	24	6	8	3	10	5	7
Not Available	1	0	0	0	0	0	1
Total	100	31	39	11	43	31	28

(Note: Each WS could indicate multiple reasons for changing jobs)

**Table 7**  
*Distribution by Current Title and Work Environment*

Work Environment	Current Title					Total
	Statistician	Senior Statistician	Supervisor	Leadership Role	NA	
Oppressive	1	1	0	0	0	2
Discouraging	4	3	5	1	0	13
Neutral	6	11	5	1	0	23
Relaxed	5	7	1	1	0	14
Encouraging	12	18	7	5	0	42
Stimulating	11	20	15	12	0	58
Not Available	0	0	1	0	3	4
Total	39	60	34	20	3	156

(Note: Two CWS who were temporary employees are not included. Sixty-two percent, 67%, and 85% of WS in non-supervisory, supervisory, and leadership roles, respectively, found the work environment stimulating or encouraging)

**Table 8**  
*Distribution by Reasons for Discrimination*

Discrimination	Total	
	N	%
Gender	37	72.5%
Age	13	25.5%
Nationality/Ethnicity	10	19.6%
Inability to Work Full Time	6	11.8%
Other	11	21.6%

(Note: Fifty-one WS faced discrimination hence total percentages are calculated with 51 as the denominator)

**Table 9**  
*Distribution of Discrimination by Current Title and Race/Ethnicity*

Race/Ethnicity	Current Title			Total
	Statistician / Senior Statistician	Supervisor	Leadership Role	
CWS	19	10	9	38
NCWS	7	2	3	12
Not Available	0	1	0	1
Total	26	13	12	51

(Note: Twenty-six percent, 39%, and 60% of WS in non-supervisory, supervisory, and leadership roles, respectively, perceived discrimination. Comparable percentages of CWS and NCWS perceived discrimination)

**Table 9a***Distribution of Gender Discrimination by Current Title and Race/Ethnicity*

Race/Ethnicity	Current Title			Total
	Statistician / Senior Statistician	Supervisor	Leadership Role	
CWS	14	9	8	31
NCWS	2	2	2	6
Total	16	11	10	37

(Note: Sixteen percent, 33%, and 50% of WS in non-supervisory, supervisory, and leadership roles, respectively, perceived gender discrimination)

**Table 10***Distribution by Number of Jobs Changed and by Race/Ethnicity*

Race/Ethnicity	1	2	3	4	5	6	7	>7	Total
CWS	24	33	27	19	12	2	2	1	120
NCWS	7	5	11	8	2	2	2	0	37
Not Available	0	0	0	1	0	0	0	0	1
Total	31	38	38	28	14	4	4	1	158

**Table 11***Distribution by Current Job Title, Race/Ethnicity, and Work Status*

Current Title	Status	Race/Ethnicity			Total
		CWS	NCWS	NA	
Statistician	Part Time	2	0	0	2
	Full Time	25	12	0	37
Senior Statistician	Part Time	9	0	0	9
	Full Time	40	11	0	51
Supervisor	Part Time	0	1	0	1
	Full Time	25	8	0	33
Leadership Role	Part Time	1	0	0	1
	Full Time	14	5	0	19
Not Available	Part Time	0	0	0	0
	Full Time	2	0	1	3

(Note: Two CWS who were temporary employees are not included)

**Table 12***Distribution by Current Job Title, Work Status, and Reasons for Working Part Time or for Working Full Time but not Working Overtime*

Work Status	Reasons	Current Title				Total
		Statistician	Senior Statistician	Supervisor	Leadership	
Part Time	Family	1	9	0	0	10
	Higher Education	1	0	0	0	1
	Other	0	0	1	1	2
Full Time	Family	3	11	3	1	18
	Higher Education	1	0	0	0	1
	Social Involvement	1	1	0	0	2
	Hobbies	2	0	0	0	2
	Personal Health	1	2	1	0	4

(Note: Only 40 WS responded)



**Table 13***Distribution of Reasons for Working Part Time or not Working Overtime*

Reason	Total
Family	28
Higher Education	2
Social Work	2
Hobbies	3
Health	4
Other	2
Total	41

**Table 13a***Distribution by Reasons for Working Part Time or for Working Full Time but not Working Overtime, and by Race/Ethnicity*

Race/Ethnicity	Reasons								Total
	Family	Higher Education	Social Involvement	Hobbies	Personal Health	Other	NAP	Blank	
CWS	20	1	0	3	4	1	26	65	120
NCWS	8	1	2	0	0	1	11	14	37
Not Available	0	0	0	0	0	0	1	0	1
Total	28	2	2	3	4	2	38	79	158

*(Note: NAP stands for Not Applicable. Twenty-four percent CWS and 32% NCWS worked part time or worked full time but did not work overtime)***Table 13b***Distribution by Availability of Onsite Childcare Facilities and Reasons for Working Part Time or for Working Full Time but not Working Overtime*

Childcare	Reasons								Total
	Family	Higher Education	Social Involvement	Hobbies	Personal Health	Other	NAP	Blank	
Yes	9	1	0	1	0	0	12	33	56
No	19	1	2	2	4	1	25	43	97
NA	0	0	0	0	0	1	0	4	5
Total	28	2	2	3	4	2	37	80	158

*(Note: Thirty-seven percent WS had onsite childcare facilities)***Table 13c***Distribution by Availability of Stress Management Facilities and Reasons for Working Part Time or for Working Full Time but not Working Overtime*

Stress Management	Reasons								Total
	Family	Higher Education	Social Involvement	Hobbies	Personal Health	Other	NAP	Blank	
Yes	4	0	0	0	0	0	4	14	22
No	4	0	0	0	1	1	11	17	34
NA	20	2	2	3	3	1	22	49	102
Total	28	2	2	0	4	2	37	80	158

*(Note: Only 9% WS had stress management facilities available and among them only 4 worked less for family reasons)*

**Table 14***Distribution by Number of Areas of Interest in Drug Development and by Current Job Title*

Number of Areas	Current Title				Total
	Statistician	Senior Statistician	Supervisor	Leadership Role	
1	11	23	10	4	48
2	12	10	12	5	39
3	12	19	5	4	40
4	4	5	2	2	13
>= 5	0	2	2	3	7
Total	39	59	31	18	147

*(Note: Sixty-seven percent of WS were interested in 2 or more areas)***Table 14a***Distribution by Age and Areas of Interest in Drug Development*

Area	Age						Total
	21-30	31-40	41-50	51-60	61-70	NA	
Data Management	5	18	11	3	1	0	38
Programming	9	26	8	4	0	1	48
Validation	6	16	7	4	1	0	34
Regulatory Affairs	9	24	12	5	2	0	52
Drug Surveillance	8	9	3	1	2	0	23
Project Management	11	29	22	4	1	0	67
Research	8	26	20	7	2	0	63
Other	3	9	4	3	1	0	20

*(Note: This included a total of 147 WS and 2 CWS who were temporary employees. Each WS could indicate multiple areas of interest)***Table 15***Distribution by Current Title and Areas of Interest in Drug Development*

Area	Current Title				Total
	Statistician	Senior Statistician	Supervisor	Leadership Role	
Data Management	16	12	4	7	38
Programming	17	19	4	7	47
Validation	8	13	6	7	34
Regulatory Affairs	10	19	15	7	51
Drug Surveillance	6	8	5	4	23
Project Management	14	27	19	6	66
Research	14	27	10	10	61
Other	2	9	7	2	20

*(Note: One of two CWS who were temporary employees and not included here, was interested in programming, regulatory affairs, and project management; both were interested in research. Two WS working at the leadership level, 3 supervisors, 1 senior statistician, and 3 WS, who did not provide information about their current title, did not respond to this question)*

**Table 16***Distribution of WS Receiving Management Help towards Career Growth by Different Available Facilities*

Management Help	Number of WS	
	N	%
Strong Mentoring	56	35.4%
Management Training	38	24%
Career Ladder	25	15.8%
Advanced Technical Training	91	57.6%
Funded Conference Attendance	113	71.5%
Research Activity	26	16.5%
Experience in Other Related Areas	50	31.7%
Other	7	4.4%

**Table 16a***Distribution of WS Receiving Management Help towards Career Growth by Number of Facilities Available*

Number of Facilities	Number of WS	
	N	%
0	14	8.9%
1	31	19.6%
2	37	23.4%
3	41	26%
4	12	7.6%
5	17	10.8%
6	4	2.5%
7	2	1.3%

**Table 17***Distribution of Women by Satisfaction with Management Help towards Career Growth and Current Job Title*

Satisfaction	Current Title				Total
	Statistician / Senior Statistician	Supervisor	Leadership Role	NA	
Dissatisfied	8	4	1	0	13
Not Very Satisfied	0	0	0	0	0
Neutral	39	13	5	0	57
Satisfied	43	11	10	0	64
Very Satisfied	9	5	4	0	18
Not Available	0	1	0	3	4
Total	99	34	20	3	156

*(Note: Two CWS who were temporary employees are not included)***Table 18***Distribution by Satisfaction with Management help towards Career Growth and Perception of Management Attitude*

Satisfaction	Management Attitude			Total
	Discouraging	Unsupportive	Uninterested	
Dissatisfied	10	3	0	13
Not Very Satisfied	0	0	0	0
Neutral	32	10	0	42
Satisfied	3	0	0	3
Very Satisfied	0	0	0	0
Total	45	13	0	58

**Table 19**

*Distribution by Opportunities to make Significant Contributions, Satisfaction with Recognition Received for Contributions, and Race/Ethnicity*

Opportunities	Race/ Ethnicity	Satisfaction with Recognition for Contributions						Total
		Dissatisfied	Not Very Satisfied	Neutral	Satisfied	Very Satisfied	NA	
None	CWS	2	3	6	1	0	1	13
	NCWS	1	0	1	0	0	0	2
	NA	0	0	1	0	0	0	1
Very Few	CWS	2	7	6	6	3	0	24
	NCWS	1	3	5	3	1	0	13
Some	CWS	1	6	17	27	7	0	58
	NCWS	1	1	7	7	1	0	17
Many	CWS	0	0	2	12	8	0	22
	NCWS	0	0	0	4	0	0	4
Not Applicable	CWS	0	0	0	1	0	0	1
Not Available	CWS	0	0	0	0	0	2	2
	NCWS	0	0	0	0	0	1	1
Total		8	20	45	61	20	4	158

**Table 19a**

*Distribution by Opportunities to make Significant Contributions, Satisfaction with Recognition Received for Contributions, and Current Job Title*

Opportunities	Current Title	Satisfaction with Recognition for Contributions						Total
		Dis- satisfied	Not Very Satisfied	Neutral	Satisfied	Very Satisfied	NA	
None	Statistician	2	0	4	0	0	0	6
	Sr. Statistician	1	1	1	0	0	0	3
	Supervisor	0	2	3	1	0	0	6
	Leadership R	0	0	0	0	0	0	0
Very Few	Statistician	0	4	4	3	2	0	13
	Sr. Statistician	3	4	6	5	2	0	20
	Supervisor	0	2	1	1	0	0	4
	Leadership R	0	0	0	0	0	0	0
Some	Statistician	1	3	8	2	1	0	15
	Sr. Statistician	0	1	11	11	5	0	28
	Supervisor	0	2	3	11	2	0	18
	Leadership R	1	1	2	9	0	0	13
Many	Statistician	0	0	1	3	0	0	4
	Sr. Statistician	0	0	1	7	1	0	9
	Supervisor	0	0	0	2	4	0	6
	Leadership R	0	0	0	4	3	0	7
Not Applicable	Vice President	0	0	0	1	0	0	1
Not Available		0	0	0	0	0	3	3
Total		8	20	45	60	20	3	156

*(Note: Two CWS who were temporary employees are not included)*

**Table 20**

*Distribution of Perception of WS at Different Career Levels about Opportunities Given to Others in their Organization*

Opportunity Given to Others	Current Title				Total
	Statistician / Senior Statistician	Supervisor	Leadership Role	NA	
Yes	10	5	2	0	17
No	35	7	4	0	46
NA	54	22	14	3	93
Total	99	34	20	3	156

*(Note: Two CWS who were temporary employees are not included. Ninety-three WS didn't respond to this item. Among the 63 who responded, only 17, including 5 supervisors and 2 directors, thought their opportunities were given to others)*

**Table 21**

*Distribution of Extra Curricular Activities by Work Status*

Work Status	Mentoring	Community Activity	Mentoring & Community Activity	NA	Total
Full Time	28	4	6	104	142
Part Time	5	1	1	6	13
Not Applicable	0	0	1	2	3
Total	33	5	8	112	158

*(Note: Only 46 WS responded, while 18 others were involved in activities, such as working for the local ASA chapter, judging and evaluating posters and projects, etc.)*

## Appendix II: Questionnaire

Are you currently working, or in the past have you worked, in the drug industry (Pharmaceutical, Biotech, or Clinical Research Organization)?

Yes    No

Your gender:    Female    Male

NOTE: If you are a male statistician and/or have never worked in the drug industry, please go to the end of the survey. Women statisticians who are currently working, or in the past have worked in the drug industry, please continue with the rest of the survey. Thank you!

### Current or Most Recent Experience in the Drug Industry

1. Total number of years of experience in the following industries:

Pharmaceutical: \_\_\_\_\_

Biotech: \_\_\_\_\_

Clinical Research Organization (CRO): \_\_\_\_\_

2. How many jobs have you had in your career so far (including the current one)?\_

3. Reasons for leaving previous jobs (Mark all that apply):

Better opportunities

More responsibility

Challenging work

Lack of opportunity for professional growth

Inadequate compensation

Poor management

Discrimination

Family considerations

Other \_\_\_\_\_

NOTE: The following questions pertain to your current position in the drug industry. If you are not currently working in the drug industry, but have worked there in the past, please apply these questions to your most recent experience.

4. Your current title and department: \_\_\_\_\_

5. Number of years of experience in the present position: \_\_\_\_\_

6. Do you currently supervise any statisticians, programmers, or data management people?

No

Yes. How many? \_\_\_\_\_

7. Number of statisticians in your department:

In the same or equivalent position:    Women: \_\_\_\_\_    Men: \_\_\_\_\_

In higher positions: Women: \_\_\_\_\_ Men: \_\_\_\_\_  
In lower positions: Women: \_\_\_\_\_ Men: \_\_\_\_\_  
In temporary positions on contract: Women: \_\_\_\_\_ Men: \_\_\_\_\_

8. How would you describe your work environment?

Stimulating  
Encouraging  
Relaxed  
Discouraging  
Oppressive

9. In what areas related to drug development are you interested in gaining experience?

(Mark all that apply.)

Data management  
Programming  
Validation  
Regulatory affairs  
Drug surveillance of marketed drugs  
Project management  
Methodological research  
Other \_\_\_\_\_

10. How has management been helpful in your professional advancement? (Mark all that apply.)

Providing strong mentorship  
Providing formal management training programs  
Creating career ladder programs  
Providing opportunities for technical training  
Funding attendance at professional seminars and conferences  
Providing opportunities for conducting methodological research beyond working on company projects  
Providing opportunities for gaining experience in other areas related to drug development  
Other \_\_\_\_\_

11. Are you satisfied with the help received from management in realizing your career growth?

Very satisfied  
Satisfied  
Neutral  
Not very satisfied  
Dissatisfied

12. If you are not satisfied, has management been...

Discouraging  
Unsupportive



Uninterested

Other \_\_\_\_\_

13. Are you given opportunities to make significant contributions (in terms of presentations to senior management, participation in important papers and policy documents, membership of committees, etc.)?

Many    Some    Very Few    None

14. If none, then do you find that men, younger women, or women of certain races are given opportunities denied to you?

Yes    No

15. Are you satisfied with the recognition you've received for your contributions (in terms of promotions, bonuses, acknowledgement, and more responsibility)?

Very satisfied

Satisfied

Neutral

Not so satisfied

Dissatisfied

16. Do you work full time or part time?

Full time    Part time

17. If you work part time, or if you work full time but are unable to work overtime, is it due to one of the following reasons? (Mark all that apply.)

Family commitments

Pursuit of higher education

Social involvement

Hobbies

Personal health

Other \_\_\_\_\_

18. Does your company provide child-care facilities?

Yes    No

19. Has your health been affected by stress in the workplace?

Yes    No

20. If yes, has management been helpful in coping with stress?

Yes    No

21. Have you ever been discriminated against in the workplace?

Yes    No

22. If yes, is it due to your: (Mark all that apply.)

Gender

Age  
Nationality/Ethnicity  
Inability to work full time or overtime  
Other \_\_\_\_\_

#### Personal and Professional Background

23. What is your highest degree in statistics, mathematics, or related fields? (Choose one.)  
BS MS MPH PhD ScD Other  
Name the field if other than statistics: \_\_\_\_\_

24. Where did you receive the above degree?  
Name of the university: \_\_\_\_\_  
Country: \_\_\_\_\_

25. Nationalities: \_\_\_\_\_

26. Race/Ethnicity:  
African  
Asian  
Caucasian  
Hispanic  
Native American  
Pacific Islander  
Others \_\_\_\_\_

27. Age:  
21-30      31-40      41-50      51-60      61-70      71 and above

28. Name the statistical and professional organizations of which you are an active member.  
(Name up to three organizations.)  
\_\_\_\_\_

29. Professional extra curricular activities undertaken by you to create awareness or increase interest in statistics in the community: (choose as many as applicable)  
Mentoring students and/or teachers at schools or universities  
Organizing or chairing the panel of statistics-related community activities, such as student competitions, general-interest lectures, etc.  
Other \_\_\_\_\_

30. In what way can the *Committee on Women in Statistics* of the International Statistical Institute and careers as statisticians and leaders?  
\_\_\_\_\_